Multinationals, Intrafirm Trade, and Employment Volatility

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Abstract

This paper examines the theoretically ambiguous relationship between the volatility of employment growth and the foreign exposure of a firm. We use unique firm-level data for Japan for the period 1994-2012, which allow us to examine the differences between 1) multinational firms, trading firms, and nontrading firms; 2) manufacturing and wholesale and retail trade; and 3) intrafirm and interfirm trade. One of the major findings is that, in manufacturing, the effect of exports on the volatility of employment varies depending on the share of intrafirm exports to total sales. In contrast, in wholesale and retail trade, exports do not have significant effects on employment volatility. The results suggest that intrafirm trade transmits the effects of foreign demand and supply shocks differently between manufacturing and wholesale and retail trade.

Keywords: Employment volatility, Multinational firm, Intrafirm trade, Wholesale and retail trade
JEL classification: F1; F16; L25; L81

"In an economy that is more open to foreign trade and investment, the demand for labor will generally be more responsive to changes in the price of labor, or more elastic. ... The flattening of labor demand curves as a consequence of globalization results in greater instability in labor market outcomes." – Rodrik (1997, p.16 and p.19)

1   Introduction

Increased labor demand elasticities have important labor market consequences. As Rodrik (1997) noted, one of the main concerns is the relationship between foreign exposure and employment volatility: firms that are exposed to foreign demand and/or supply are expected to have higher labor demand elasticities. For example, trade liberalization could cause greater product market competition, which results in higher labor demand elasticities (e.g., Rodrik, 1997). Offshoring could increase the substitution between foreign and domestic workers, which also flattens the labor demand curve (e.g., Senses, 2010). Thus, it is widely believed by the general public that the employment of firms with higher foreign exposure tends to be more volatile than the employment of domestic firms.

If firms are risk neutral, whether employment volatility is high or not does not seem to be a problem, providing that there are no labor adjustment costs. However, when firms face high labor adjustment costs, higher employment volatility will be an issue because it will generate large adjustment costs to the economy as a whole. Indeed, OECD (2005) featured labor adjustment costs as one of the concerns relating to the expansion of international trade and foreign direct investment (FDI). The adjustment of labor in response to foreign exposure is an important concern for policy makers.

Despite this importance, the relationship between foreign exposure and employment volatility is theoretically ambiguous. In the case of exports, on the one hand, employment volatility will be higher for exporters than for nonexporters if the volatility of shocks is sig-

nificantly higher for the trading partners than for the home country (in this paper, Japan), or if the export activity itself is volatile, owing to, for example, changes in the exchange rate. On the other hand, exporters may be able to absorb demand shocks in one country, diversifying their activities in other countries.

Similarly, in the case of imports, a firm that sources inputs from many countries can more easily absorb a shock to a particular input by switching its sources to another country, compared with a firm that sources inputs only from the domestic market. In contrast, importers could have higher employment volatility if imported intermediate inputs are easily substitutable for labor inputs. A similar argument can be applied to the case of FDI. Because the effects of foreign exposure on employment volatility are ambiguous in theory, empirical analysis is needed to clarify which effects appear to be strongest in reality.

A number of studies have examined the causes and effects of sales volatility.[1] For example, Comin et al. (2009) examined the relationship between sales and wage volatilities among US firms and found a positive relationship. However, the study did not distinguish between sales for the domestic market and exports. Buch et al. (2009) examined the relationship between export openness and output volatility, using firm-level data on German manufacturing firms for the period 1980–2011. They found that exporters had a lower volatility of sales than nonexporters, although they did not focus on employment volatility. Vannoorenberghe (2012) examined the relationship between sales volatility and the export intensity of a firm, as measured by the share of exports to total sales. Using French firm-level data, the study found that export intensity had a positive and substantial effect on sales volatility. The study did not address the issue of labor market consequences.

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[1] Another related strand of studies is the estimation of labor demand functions, focusing on the difference between multinational and domestic firms (e.g., Barba Navaretti et al., 2003; Fabbri et al., 2003; Kiyota and Matsuura, 2006; Murakami and Fukao, 2007; Buch and Lipponer, 2010). Note, however, that increases in labor demand elasticity are not necessarily enough to explain increases in employment volatility because high volatility in output (occurring through, for example, productivity shocks) could also result in high employment volatility.

To our knowledge, only Kurz and Senses (2016) have examined the relationship between foreign exposure and employment volatility. Using firm- and transaction-level data from US manufacturing firms between 1991 and 2005, they found that the employment of exporters was less volatile than that of domestic firms, whereas that of importers was more volatile. Their study also found a nonmonotonic relationship between export status and employment volatility: the effects of exports could be more or less volatile, depending on the share of exports to total sales. They concluded that "as long as a firm's overall exposure is not too large, exporting affords firms the ability to diversify their demand sources across countries and products" (p. 174).

Building upon Kurz and Senses (2016), this paper examines the effects of international trade and FDI on employment volatility, using large-scale, firm-level data from Japan. The major contributions of this paper are threefold. First, we distinguish between multinational firms, trading firms, and nontraders in analyzing the relationship between foreign exposure and employment volatility. Although Kurz and Senses (2016) made significant contributions to the literature, the scope of their study is limited in that they did not take into account the effects of FDI, even though FDI is an important globalization channel for firms. Our study examines the heterogeneous effects of foreign exposure on employment volatility in a more comprehensive way.

Second, we expand the industry coverage of the analysis. Our data cover not only manufacturing but also wholesale & retail trade firms. As Bernard et al. (2010a) emphasized, not only producers but also wholesale & retail traders engage in international trade. In addition, they found that wholesale traders behaved differently from producers. For example, trade by wholesale traders was less sensitive to market size, compared with trade by manufacturing firms. Similarly, Comin et al. (2009) found that the relationship between sales and wage volatility was stronger in services than in manufacturing firms. This is because, in the service sector, it can be difficult to monitor or assess using other performance measures,

which makes it difficult to relate the worker's individual performance and incentives to firm goals. As a result, when a firm sets wages, it needs to relate wages to observable firm-level performances (i.e., sales). The distinction between these types of firms is important for a deeper understanding of international trade.

Third, we take into account the difference between intrafirm trade and interfirm trade. The effects of intrafirm trade on employment volatility are also ambiguous. On the one hand, because intrafirm trade is, by definition, a transaction within a firm, the uncertainty of trade is expected to be smaller than that of interfirm trade. As a result, the firms with a higher intensity of intrafirm trade could experience less employment volatility than the firms with lower intensity, holding other factors constant.[2] On the other hand, if the intrafirm trade is based on the supply chain of some specific products, the firm could lack flexibility when unexpected shocks hit foreign demand or the supply chain itself. For example, when severe flooding hit the Thai economy in 2011, Honda had to halve its production in its plants in Japan and North America, even though these plants were not directly affected by the floods, because the affected plants in Thailand disrupted the supply of parts and components (*Toyokeizai*, Japanese version, November 14, 2011). Distinguishing between intrafirm and interfirm trade allows us to examine which channel transmits foreign shocks to domestic employment.

In addition to these contributions, this paper is the first study that addresses the relationship between foreign exposure and the employment volatility of firms in Japan.[3] Thus, our study contributes to the literature by adding another national perspective to the available evidence. Furthermore, our study covers the period 1994–2012, making it the most current

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[2]Kiyota et al. (2008) found that the intrafirm trade of Japanese multinational enterprises (MNEs) increased as the exchange rate uncertainty increased. This result suggests that intrafirm trade helps make adjustments within the firm to absorb exchange rate shocks.

[3]Using the firm-level data for Japan from the *Basic Survey of Japanese Business Structure and Activities* (BSJBSA), Tanaka (2013) examined the effects of trade on sales volatility, but not on employment volatility. Similarly, Yokoyama et al. (2015) utilized the BSJBSA firm-level data to examine the effects of the exchange rate on employment. The analysis, however, did not focus explicitly on employment volatility.

firm-level study on foreign exposure and employment volatility.

The remainder of the paper is organized as follows. Section 2 explains our analytical framework and the data used in the paper. In Section 3, we present the baseline regression results as well as a discussion of the robustness of our results and extensions of our analysis. Concluding remarks are presented in Section 4.

2   Analytical Framework

2.1   Methodology

For the measurement of employment volatility, following Kurz and Senses (2016), we employ a "residual" approach. Let i, j, and t denote the firm, industry, and year, respectively. Let γ_{ijt} denote the growth of employment E_{it}. We define γ_{ijt} as the conditional (residual) growth rate of employment estimated from the following specification:

$$\gamma_{ijt} = \ln(E_{it}) - \ln(E_{it-1}) = \phi_i + \mu_{jt} + \upsilon_{ijt}, \tag{1}$$

where ϕ_i is firm fixed effects, which capture the unobserved firm-specific characteristics, including the employment system used; μ_{jt} is industry–year fixed effects, which capture the industry–year-specific shocks; and υ_{ijt} reflects the deviation of employment from the firm and industry averages at year t. The volatility σ is calculated as the standard deviation of the residual growth rates for a window of length w:

$$\sigma_{ij}^w = \sqrt{\frac{1}{w-1} \sum \upsilon_{ijt}^2}. \tag{2}$$

To test the linkage between the firm's foreign exposure and its employment volatility

formally, we start by estimating the following specification:

$$
\begin{aligned}
\ln \sigma_{ij}^w \;=\;& \beta_0 + \beta_1 Both_i^w + \beta_2 X_i^w + \beta_3 M_i^w + \beta_4 x_i^w + \beta_5 m_i^w \\
& + \beta_6 Both_i^{int,w} + \beta_7 X_i^{int,w} + \beta_8 M_i^{int,w} + \beta_9 x_i^{int,w} + \beta_{10} m_i^{int,w} \\
& + \beta_{11} FDI_i^w + \beta_{12} Foreign_i^w + \alpha Z_i^w + \theta Y_j^w + \varepsilon_{ij}^w,
\end{aligned}
\tag{3}
$$

where $Both_i^w$ is an importer as well as an exporter dummy; X_i^w is an exporter (but not importer) dummy; M_i^w is an importer (but not exporter) dummy; x_i^w is the share of exports relative to sales; m_i^w is the share of imports relative to purchases; $Both_i^{int,w}$ is an intrafirm importer as well as an intrafirm exporter dummy; $X_i^{int,w}$ is an intrafirm exporter (but not intrafirm importer) dummy; $M_i^{int,w}$ is an intrafirm importer (but not intrafirm exporter) dummy; $x_i^{int,w}$ is the share of intrafirm exports to sales; $m_i^{int,w}$ is the share of intrafirm imports to purchases; FDI_i^w is a dummy for firms that engage in FDI; $Foreign_i^w$ is a dummy for foreign-owned firms; Z_i^w and Y_j^w are the firm and industry control variables, respectively; and ε_{ij}^w is an error term. The firm and industry control variables are calculated as the average over w, the window of interest.

2.2 Data

2.2.1 Source and industry classification

Our data come from the *Basic Survey of Japanese Business Structure and Activities* (BSJBSA) compiled by the Ministry of Economy, Trade, and Industry (METI), Japan. The purpose of this survey is to capture an overall picture of Japanese corporate activities, including globalization and diversification, as well as basic corporate characteristics, including sales, cost, profit, employment, assets, and debt. The strengths of this survey are the sample coverage and the reliability of its information. Indeed, the survey is compulsory for firms with more

than 50 employees and with capital of more than 30 million yen in both manufacturing and nonmanufacturing industries, although some nonmanufacturing industries, such as construction, medical services, and transportation services, are not included. In this study, we focus on manufacturing and the wholesale & retail trade industry, because data for these industries are available throughout our sample period.

In the BSJBSA, an industry classification code is assigned to each firm, based on their main activities. For example, suppose that a firm engages in both manufacturing and wholesale activities. If its largest revenue is from wholesale activity, the firm is classified as a wholesale trade firm. This implies that firms in the wholesale trade industry do not always specialize in wholesale activities. Moreover, there are some firms that switch from one industry to another during our sample period. Although firms switching industries is an important issue, we assign each firm the industry classification to which it belongs most frequently during our sample periods.[4]

2.2.2 Sample selection

We use the BSJBSA covering the period 1994–2012. Following Kurz and Senses (2016), we first delete the observations in the top and bottom first percentiles in terms of the employment level and the employment growth rate on the basis that they are outliers. Second, we restrict the sample to those firms that report their employment for at least five consecutive years to obtain sufficient observations to calculate firm-level volatility. In the BSJBSA as a whole, there exist 43,382 manufacturing and wholesale retailing firms. We exclude 15,545 firms that report employment for less than five years. As a result, our sample consists of 27,838 firms (15,978 manufacturing firms and 11,860 wholesale & retail trade firms). As the data for 1994 are used to calculate the employment growth rate for 1995, the volatility measure is available from 1995 to 2012, an 18-year window.

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[4]For the product switching behavior of firms, see Bernard et al. (2010b), Kawakami and Miyagawa (2010), and Bernard and Okubo (2013).

2.2.3 Employment

Employment is measured by the number of permanent workers. In the BSJBSA, permanent workers are defined as workers with a contract period that extends for one month or longer, or an employee who worked for 18 days or more in each of the last two months in the previous fiscal year. The permanent workers comprise regular workers (i.e., *Seishain* or *Seikishokuin* in Japanese) and part-time workers (i.e., *Parto* or *Arubaito* in Japanese), but daily workers (i.e., *Hiyatoi* in Japanese) and dispatched workers (i.e., *Haken* in Japanese) are excluded.[5]

Other than regular workers and part-time workers, there are two classifications of workers, daily workers and dispatched workers. As noted, daily workers are not included as permanent workers because their contract period is shorter than one month. Dispatched workers are also excluded because they have no direct employment contract but are dispatched from temporary worker agencies. We refer to daily workers and dispatched workers as temporary workers.[6] The number of workers can be disaggregated by the sectors within a firm, such as the research and development sector and the manufacturing sector. However, the wage bills are available only at the firm level.

2.2.4 Trade and multinational enterprise (MNE) status

From the BSJBSA, we obtain variables for trade status, MNE status, and export and import intensity. Trade status includes four categories: firms that do not engage in trade (*Nontrader*), firms that engage only in exports (*Exports only*), firms that engage only in imports (*Imports only*), and firms that engage in both exports and imports (*Both*). We define *Imports only* (*Exports only*) firms as those that engage in importing (exporting) in at least one year during our sample period, but do not engage in exporting (importing). *Both*

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[5]The use of permanent and regular workers in this paper follows Yokoyama et al. (2015). In Section 3.3, we extend the analysis, focusing on regular workers only.

[6]As a robustness check, we include daily workers and dispatched workers in the total number of employees. The number of dispatched workers is available after 2000.

firms are defined as those that engage in exporting and importing in at least one year in the 18-year window.[7] The rest of the firms are classified as *Nontraders*. Export and import intensities are defined as the ratio of exports to total sales and the ratio of imports to total procurement, respectively.[8]

One may ask what kind of wholesale & retail trade firms engage in exports and/or imports. A typical example in the wholesale trade is trading companies. Similarly, some large retail trade firms import foreign products by themselves. Note also that firms could engage in both manufacturing and wholesale & retail trade activities. Firms that engage in both manufacturing and wholesale & retail trade activities are classified as wholesale & retail trade firms if their main sales come from wholesale & retail trade activities.

In the BSJBSA, MNEs consist of two types of firms: foreign-owned firms and Japanese firms that engage in FDI. A *Foreign-owned firm* is defined as a firm with a foreign capital share greater than 50 percent and with headquarters located outside of Japan. An *FDI firm* is defined as a firm that has at least one foreign affiliate.[9] The rest of the firms are classified as non-MNEs. Specifically, MNE status is defined in the same way as trade status. FDI firms are those firms that have foreign subsidiaries for at least one year in the 18-year window. Similarly, foreign-owned firms are those firms that have foreign parent firms at least once during the 18 years. The rest of the firms are classified as *non-MNEs*.

The other feature of this survey is the availability of the data for intrafirm trade. The BSJBSA reports the exports and imports to/from the firms' majority-owned foreign affil-

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[7] *Both* includes firms that export in one year and import in another year.

[8] For 1995 and 1996, the value of exports and imports is not available; instead, we obtain sales to and purchases from foreign countries. These variables include transactions between foreign branches and foreign sales or purchases through trading companies as well as exports and imports. As both export and foreign sales (imports and purchases from foreign countries) are available for 1997, we adjust the value of foreign sales (purchases from foreign countries) in 1995 and 1996 by using the ratio of exports to foreign sales (imports to purchases from foreign countries) at the industry level. We also modify intrafirm export and import intensity in the same way.

[9] If the foreign-owned firms also have foreign affiliates outside Japan, they are classified not as FDI firms but as foreign-owned firms. In the BSJBSA, a Japanese foreign affiliate is defined as an affiliate with a capital share of more than 20 percent.

iates. To distinguish between intrafirm and interfirm trade, we construct intrafirm export and import intensity variables (*Intrafirm export intensity* and *Intrafirm import intensity*, respectively) as well as intrafirm trade status variables (*Intrafirm both, Intrafirm exports only, and Intrafirm imports only*). Intrafirm export and import intensities are defined as the ratio of intrafirm exports to total sales and the ratio of intrafirm imports to total procurement, respectively. Firms that engage in intrafirm trade are a subset of MNEs and trading firms (either exporters or importers).

2.2.5 Control variables

To control for firm characteristics (i.e., Z_i^w in equation (3)), we use the number of employees (*Employment*, log value) and the number of establishments (*Number of establishments*, log value), the R&D–sales ratio (*R&D–sales ratio*), the firm age (*Age*), and the share of nonproduction workers (*Share of nonproduction workers*). The share of nonproduction workers is defined as the ratio of nonproduction workers to total employees at the firm level.[10]

Industry control variables (i.e., Y_j^w in equation (3)) include the industry-level share of nonproduction workers (*Industry nonproduction worker share*), the size of the industry (*Industry size*), the import penetration ratio (*Import penetration*), and the capital–labor ratio (*Industry capital–labor ratio*). The industry skill share is calculated by aggregating the firm-level share of nonproduction workers. The size of the industry is the aggregated number of employees by industry (log value). The import penetration ratio and the capital–labor ratio are obtained from the Japan Industry Productivity (JIP) database.[11] The import penetration ratio is defined as the ratio of imports to total domestic demand. As the import data in the JIP database come from trade statistics, exports and imports for the wholesale &

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[10]To calculate the share of nonproduction workers, we first obtain the number of employees who work in the manufacturing plant or engage in manufacturing activities in the firm headquarters. We then subtract this number from the total number of employees, which implies the number of nonproduction workers. The share of nonproduction workers is defined as the ratio of this number to the total number of employees.

[11]The database is downloadable from `http://www.rieti.go.jp/en/database/JIP2014/index.html`. For more details about the JIP database, see Fukao et al. (2007).

retail industry are not available. The capital–labor ratio is the ratio of the net capital stock to person-hour labor inputs. These control variables are calculated as an average over the 18-year window.

2.3   Descriptive statistics

Table 1 provides basic descriptive statistics for the 18-year window from 1994 to 2012 for the full sample of firms and by trade and MNE status for all industries.[12] Column (1) shows the number of firms. Column (2) shows the shares of firms, in terms of the number of firms, by trade and MNE status. Column (3) indicates the average employment size. Columns (5) and (6) show the mean and standard deviation of employment volatility, measured by equation (2). Our sample consists of 27,838 firms, of which 46.8 percent (13,036 firms) engage in international trade and 25.2 percent (7,014 firms) are MNEs.

=== Table 1 ===

Four findings stand out from Table 1. First, there is a systematic relationship between firm size and trade status. Firms that engage in either exports or imports are larger than those that do not. Moreover, firms that engage in both exports and imports are even larger than those that engage in either exports or imports. Second, similarly, there is a systematic relationship between firm size and MNE status. On average, firms that engage in FDI are more than 1.5 times as large as those that do not. Foreign-owned firms are more than twice as large as those that do not engage in FDI. These results together indicate that firms that engage in international trade and FDI are generally larger than those that do not.

Third, the employment volatility of firms that import only is larger than that of those firms that do not trade. In contrast, the employment volatility of firms that engage in

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[12]Table A1 presents the number of firms, by sector and by year, whereas Table A2 presents the summary statistics of variables used in the regression analysis. This paper takes each two-digit industry category as a "sector", whereas each three-digit industry category is an "industry". All the industry characteristics are computed at the industry (three-digit) level.

exports only is smaller than that of those firms that do not trade. The results suggest that exports and imports have different effects on employment volatility. Finally, the employment volatility of foreign-owned firms is larger than that of non-MNEs and FDI firms. The results imply that the employment volatility could also vary across MNE status.

We note that although the shares of trading firms and MNEs are less than 53 percent and 74 percent in terms of the number of firms, respectively, their shares in terms of employment are large. Figure 1 presents the employment share, by trade and MNE status. In 2012, for example, the employment share of trading firms is 59.9 percent. Similarly, the employment share of MNEs is 44.1 percent. This implies that the employment volatility of trading firms and MNEs could have substantial effects on the Japanese labor market.

=== Figure 1 ===

Table 2 decomposes the basic statistics into manufacturing and wholesale & retail trade. Our sample consists of 15,978 manufacturing firms and 11,860 wholesale & retail trade firms. Whereas 54.1 percent of firms (8,646 firms) engage in international trade in manufacturing, 37.0 percent of firms (4,390 firms) do so in wholesale & retail trade. Similarly, the share of MNEs is 30.4 percent (4,863 firms) in manufacturing, whereas it is only 18.1 percent (2,151 firms) in wholesale & retail trade. These figures suggest that wholesale & retail trade firms are more likely than manufacturing firms to focus their sales on the domestic market only.

=== Table 2 ===

We highlight three results. First, in manufacturing, we observe a similar relationship between firm size and trade status to the relationship found for all industries. On average, firms that engage in both exports and imports are the largest, followed by firms that engage in either exports or imports only. Firms that do not engage in international trade tend to be small in employment size. In contrast, in wholesale & retail trade, firms that engage

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in imports only are the largest, followed by firms that engage in both exports and imports. Firms that engage in exports only are the smallest. The large firms do not necessarily engage in exports in wholesale & retail trade. These results indicate that the relationship between trade status and firm size could be different between manufacturing and wholesale & retail trade.

Second, in both manufacturing and wholesale & retail trade, the employment volatility of firms that import only is higher than that of firms that do not trade, and the employment volatility of firms that engage in exports only is smaller than that of firms that do not trade. Third, the employment volatility of foreign-owned firms is higher than that of FDI firms and non-MNEs in wholesale & retail trade. Moreover, employment volatility is generally higher in wholesale & retail trade than in manufacturing. These results together suggest that the relationship between trade, FDI, and employment volatility differs between manufacturing and wholesale & retail trade.

One may ask whether the composition of workers differs between manufacturing and wholesale & retail trade because this could cause the difference in employment volatility. Although our data cannot distinguish differences in skill types between workers, it is possible to distinguish between production and nonproduction workers. We compute the share of nonproduction workers and examine how the share varies with trade and MNE status as well as industry types.

Table 3 presents the share of nonproduction workers, by trade and MNE status and by industry. There are three notable findings. First, the share of nonproduction workers is higher in wholesale & retail trade than in manufacturing. The average share of nonproduction workers is 34 percent in manufacturing and 94 percent in wholesale & retail trade. This result may not be surprising. Note, however, that the six percent of workers who engage in production activities even in wholesale & retail trade implies that some of the wholesale & retail trade firms also engage in production activities, despite the fact that production

activities are not their major activities (which is why they are classified as wholesale & retail trade firms).

=== Table 3 ===

Second, in manufacturing, the share of nonproduction workers tends to be high for firms that engage in international trade. In contrast, in wholesale & retail trade, the opposite relationship is confirmed: the share of nonproduction workers tends to be high for firms that do not engage in international trade. Finally, the share of production workers varies with FDI status. The share of nonproduction workers is higher for foreign-owned firms than for non-MNEs and FDI firms in both manufacturing and wholesale & retail trade. Based on the fact that the share of nonproduction workers varies across trade and MNE status as well as across industries, it is important to control for the differences in the share of nonproduction workers in examining the determinants of employment volatility.

Note that export or import status does not necessarily mean a high degree of foreign exposure because export or import intensities may be very small in some cases. Thus, it may be useful to examine the export and import intensities of the firms.[13] The upper part of Table 4 presents export and import intensities. Table 4 indicates that average export and import intensities are small, amounting to about three percent for exports and four percent for imports in all industries. We also report the shares of intrafirm exports and imports to total sales. These are also small, amounting to about one percent for intrafirm exports and two percent for intrafirm imports in all industries.

=== Table 4 ===

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[13]For the definition of export and import intensities, see Section 2.2. In this connection, one may argue that not only the intensity of trade but also the share of foreign production to total production may affect the employment volatility. While this may be true, it is difficult to obtain such information for foreign-owned firms. Even if we focus on Japanese multinationals, the sample size will decline substantially owing to limited data availability. For this reason, we do not pursue this issue further here.

One may argue that these results are affected by the existence of zero trade. Because we confirmed, in Table 1, that more than half of firms are nontraders, the average share of exports and imports is affected by zero trade. Therefore, we compute the export and import intensities, conditional on positive exports and imports, respectively. The results are presented in the lower part of Table 4. If we exclude zero-trade firms, the average share of exports and imports become slightly higher: about eight percent for exports and 11 percent for imports in all industries. Similar results are confirmed when we focus on manufacturing and wholesale & retail trade. Thus, it may not be clear how exports and imports affect employment volatility. To test the linkage between a firm's foreign exposure and its employment volatility formally, we now turn to the regression analysis.

3   Globalization and Employment Volatility in Japan

3.1   Baseline results

Tables 5 and 6 present the estimation results of equation (3) for manufacturing and wholesale & retail trade, respectively, which are estimated using the ordinary least squares method.[14] Table 5 provides the results for manufacturing, whereas Table 6 provides those for wholesale & retail trade. For the categorical variables, the coefficients of trade status (i.e., *Both*, *Exports only*, *Imports only*, *Intrafirm both*, *Intrafirm exports only*, and *Intrafirm imports only*) are relative to *Nontrader*. The coefficients of MNE status (i.e., *FDI firm* and *Foreign-owned firm*) are relative to *Non-MNEs*. We first examine the results for manufacturing and then discuss the results for wholesale & retail trade.

=== Tables 5 & 6 ===

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[14]Tables 5 and 6 report the coefficients of interest only. For the coefficients of firm and industry characteristics, see Table A3.

Column (1) in Tables 5 and 6 provides the baseline results. As pointed out by Guadalupe and Wulf (2010), this is a standard differences-in-differences specification that exploits the effects of exports and imports in which exports and imports (the "treatment") is continuous. In the baseline results, employment volatility is estimated by the residual approach for the 18-year window, as in equation (2)).[15]

Four findings are evident from the baseline results in Table 5. First, the coefficient of *Exports only* is significantly negative. This result implies that the employment of the firms that engage in exports only is less volatile than that of firms that do not engage in international trade. This result is consistent with the finding of Kurz and Senses (2016), where the number of products and of destination countries for exports have negative relationships with employment volatility. The result suggests that such diversification of products and/or destinations occurs in Japan, although Japanese firm-level data cannot identify the number of products or destination countries. Second, however, the coefficient of *Intrafirm export intensity* is significantly positive. The results together suggest that the effect of exports is more or less volatile, depending on the share of intrafirm exports to total sales.

Third, the coefficients of both *Imports only* and *Import intensity* are significantly positive. The results imply that the employment volatility becomes high as the import intensity increases. Note that the coefficient of *Intrafirm import intensity* is insignificant. The result suggests that, unlike the effects of exports, the effects of imports arise through interfirm trade. Finally, the coefficient of *FDI firm* is significantly positive, whereas that of *Foreign-owned firm* is insignificant. The results imply that outward FDI has significant effects on the employment volatility, whereas inward FDI does not.

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[15]Tables 5 and 6 report the coefficients of interest only. For the coefficients of firm and industry characteristics, see Table A3. Note that, whereas industry characteristics variables are computed at the industry (i.e., three-digit) level, the sector-window fixed effect is computed at the sector (i.e., two-digit) level owing to the perfect collinearity between industry characteristics variables and the industry-window fixed effect. Note also that the industry–year-specific shocks have been controlled for in computing employment volatility.

For wholesale & retail trade in Table 6, the baseline results are presented in column (6). We highlight five results. First, none of the coefficients of *Exports only*, *Export intensity*, *Intrafirm exports only*, or *Intrafirm export intensity* are significant. The results imply that, unlike manufacturing, exports do not have significant effects on employment volatility in general. Second, the coefficients of both *Imports only* and *Import intensity* are significantly positive. The employment volatility becomes higher as the import intensity increases, not only in manufacturing but also in wholesale & retail trade.

Third, the coefficients of *FDI firm* and *Foreign-owned firm* are insignificant. The results imply that neither outward nor inward FDI has significant effects on employment volatility. Note that, in Table 2, we confirmed the higher employment volatility of foreign-owned firms in wholesale & retail trade. Once we control for various firm and industry characteristics, the employment volatility of MNEs is almost the same as that of non-MNEs in wholesale & retail trade.

Fourth, the coefficient of *Both* is significantly positive. This result implies that the firms that engage in both exports and imports are more likely to have higher employment volatility than the firms that do not engage in trade. Finally, the coefficient of *Intrafirm import intensity* is significantly negative. This indicates that employment volatility becomes higher as the intrafirm import intensity increases.

3.2   Robustness check

One may be concerned that our results are sensitive to the measurement of employment volatility, sample period, and so on. To check the robustness of our results, we address three issues. The first issue is the measurement of employment volatility. Following Kurz and Senses (2016), we employ two alternative measures of employment volatility. One utilizes shorter windows, as we split the 18-year sample period into three six-year subperiods. The employment volatility is then calculated for each subperiod, which implies that the analysis

focuses on shorter-run effects relative to the baseline model. The other measure of employment volatility utilizes the actual employment growth rate rather than the residual growth rate (i.e., equation (2)). Here, we measure employment volatility as the standard deviation of actual employment growth, where the employment growth rate is measured as the log difference in employment between years t and $t-1$:

$$\sigma_{ij}^w = \left[\frac{1}{w-1} \sum_{\tau=0}^{w} (\gamma_{ij,t+\tau} - \bar{\gamma}_{ijt})^2 \right]^{1/2}, \tag{4}$$

where w is the length of the window (18 years) and $\bar{\gamma}_{it}$ is the average growth rate over the window w.

The second issue is the sample period. Our results may be affected by the shocks caused by the global financial crisis in 2009, the 2011 Great East Japan Earthquake, and the 2011 Thailand floods. Employment volatility increased as a result of these unexpected domestic and foreign shocks. Thus, our results may be sensitive to the choice of the sample period. To address this concern, we run the regression for the period 1994–2008, prior to these events.

The third issue is the effects of productivity shocks. Employment may be affected by productivity shocks. Although we include industry–year fixed effects to measure the employment volatility (as in equation (2)), such productivity shocks could be heterogeneous across firms. To address this concern, we include the volatility of total factor productivity (TFP) as an additional control variable. The volatility of TFP is calculated by the same methodology as the employment volatility (i.e., equation (2)). To estimate TFP, we employ the Wooldridge–Levinsohn–Petrin method (Wooldridge, 2009).

Columns (2)–(5) in Tables 5 and 6 present the results of the robustness check. Column (2) presents the results for the six-year windows. Column (3) shows the results for actual employment growth. Column (4) presents the results for the period 1994–2008. Column (5) indicates the results in which the volatility of productivity is included as an additional control

variable. Table 5 presents the results for manufacturing. There are three notable findings. First, the coefficient of *Exports only* is significantly negative in almost all specifications, whereas the coefficient of *Intrafirm export intensity* is significantly positive in all specifications. Second, although the coefficient of *Imports only* is sensitive to the measurement of volatility or the inclusion of TFP shocks, the coefficient of *Import intensity* is significantly positive in almost all specifications. These results together suggest that the effects of exports and imports on employment are generally robust.

Third, the coefficient of *FDI firm* turns to be insignificant when we use the actual growth rate to measure the employment volatility if we focus on the sample before 2009. The coefficient of *Foreign-owned firm* is insignificant in all specifications. Noting that firms that engage in intrafirm trade are a subset of MNEs, the results in turn imply that FDI causes higher employment volatility only when the firm's share of intrafirm exports to total sales becomes high.

Table 6 presents the results for wholesale & retail trade. We highlight three results. First, as for the baseline results, none of the coefficients of *Exports only*, *Export intensity*, *Intrafirm exports only*, or *Intrafirm export intensity* are significant. Second, the coefficients of both *Imports only* and *Import intensity* are significantly positive. In contrast, the coefficient of *Intrafirm import intensity* turns to be insignificant in most specifications. The results together suggest that the effects of exports and imports on employment are mostly robust.

Third, the coefficients of *FDI firm* and *Foreign-owned firm* are insignificant. The results imply that neither outward nor inward FDI has significant effects on employment volatility. The results in turn imply that MNEs (i.e., FDI firms and foreign-owned firms) do not necessarily exhibit higher employment volatility.

In sum, in manufacturing, the effect of exports on the employment volatility varies, depending on the share of intrafirm exports to total sales. This result suggests that the effects

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of foreign demand shocks on domestic employment are transmitted through intrafirm exports. In wholesale & retail trade, the effect of exports is generally insignificant. Unlike manufacturing, there is no significant effect of foreign demand shocks on domestic employment.

In both manufacturing and wholesale & retail trade, the employment volatility tends to become higher as the share of imports to total purchases increases. This result suggests that the effects of foreign supply shocks on domestic employment come from interfirm imports. Moreover, MNEs (FDI firms and foreign-owned firms) do not necessarily exhibit higher employment volatility. In manufacturing, therefore, FDI causes higher employment volatility only when the share of intrafirm exports to total sales becomes high. In wholesale & retail trade, FDI does not necessarily result in higher employment volatility.

3.3 Extensions

3.3.1 An alternative definition of trade and MNE status

Trade and MNE status takes a value of one if firms engage in trade and FDI in at least one year during our sample period. This implies that some exporters or MNEs may engage in trade or FDI only once during the 18 years. We follow Kurz and Senses (2016) in using this definition. However, one may be interested in how our results change if we employ an alternative trade and MNE status.

To address this issue, we measure trade and MNE status based on the mode of the status. For example, if a firm is an MNE only in one year during the sample period, it is now classified as a domestic firm. In contrast, if a firm is an MNE during most of the sample period, it is classified as an MNE. We apply this measure to all trade and MNE status firms and reestimate equation (3).

Table 7 presents the regression results. Columns (1) and (6) provide the baseline results,

copied from Table 5. Columns (2) and (7) are the results that employ the alternative definition of trade and MNE status. The results indicate that, although some of the coefficients show different signs and/or significance levels from the baseline results, our main messages remain unchanged. In manufacturing, the coefficient of *Exports only* is significantly negative, whereas the coefficient of *Intrafirm export intensity* is significantly positive. The coefficient of *Import intensity* is significantly positive. These results are qualitatively the same as the baseline results.

=== Table 7 ===

In wholesale & retail trade, the coefficients of both *Imports only* and *Import intensity* are significantly positive. The coefficients of *FDI firm* and *Foreign-owned firm* are insignificant. These results are also consistent with the baseline results. One notable difference is the effects of exports. The coefficient of *Exports only* is now significantly negative. The coefficients of *Export intensity* and *Intrafirm exports only* are positive and significant. Some of the results may be sensitive to the definition of the trade and MNE status. Thus, it is important to check how the results change when the analysis employs an alternative measure of trade and MNE status.

3.3.2 An alternative definition of employment

We measure employment as the number of permanent workers. Because the definition of permanent workers does not include temporary workers, but includes part-time workers, one may be concerned that employment volatility could vary if we include temporary workers or if we exclude part-time workers (i.e., if we focus on regular workers only). Indeed, regular and nonregular workers have different degrees of employment protection (OECD, 2014, Chapter 4). As a result, employment could be less volatile in response to foreign exposure for regular workers than for nonregular workers.

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It is interesting to examine the employment volatility of regular workers (= permanent workers − part-time workers), that of part-time workers, and that of temporary workers separately. However, some firms employ neither part-time workers nor temporary workers. Moreover, the information on temporary workers is available only after 2000. As a compromise, we utilize two alternative measures of employment: the number of permanent workers and temporary workers; and the number of regular workers, which excludes part-time workers from the permanent workers category. We then compute the employment volatility and run the same regression as the baseline model.

Columns (3) and (8) in Table 7 provide the results that include temporary workers for manufacturing and wholesale & retail trade, respectively. Columns (4) and (9) in Table 7 provide the results that exclude part-time workers for manufacturing and wholesale & retail trade, respectively. The results are similar to but slightly different from those presented in Table 5.

In manufacturing, we continue to find a significantly positive coefficient for *Exports only* in both specifications. The coefficient of *Intrafirm export intensity* is also significantly positive even when the employment includes temporary workers (Column (3)). However, it is insignificant when the employment excludes part-time workers and then the coefficient of *Intrafirm exports only* turns to be significantly positive. Similarly, we continue to find a significantly positive coefficient for *Imports only*. Although the coefficient of *Import intensity* turns to be insignificant when the employment includes temporary workers, the coefficient of *Intrafirm import intensity* becomes significantly positive. In wholesale & retail trade, the results are qualitatively similar to those presented in Table 5. The effects of exports on employment volatility are generally insignificant in both specifications. Employment volatility is higher for importers and increases as import intensity increases.

These results together suggest that our main messages remain unchanged even when we utilize the alternative definition of employment. This in turn implies that employment

adjustments by trading firms occur mainly among regular workers.

3.3.3 "Pure" wholesale & retail trade firms

As noted above, firms that engage both in manufacturing and wholesale & retail trade activities are classified as wholesale & retail trade firms if their main sales come from wholesale & retail trade activities. One may then ask how the results change if we focus on wholesale & retail trade firms that do *not* engage in manufacturing activities, which we call "pure" wholesale & retail trade firms. To address this issue, we focus on such "pure" wholesale & retail trade firms.

Column (10) in Table 7 presents the results. Even when we focus on wholesale & retail trade firms that do not employ manufacturing workers, we continue to find qualitatively the same results as the baseline model. The effects of exports on employment volatility are generally insignificant in both specifications. Employment volatility is higher for importers and increases as import intensity increases. The results suggest that employment adjustments by trading firms in wholesale & retail trade firms occur mainly among nonproduction regular workers.

3.3.4 Volatility of wages

One may be interested in wage volatility as well as employment volatility. When foreign shocks hit firms, firms could adjust through employment or wages. Thus, firms with lower employment volatility may have higher wage volatility. To address this issue, we use wages rather than employment to compute the volatility and estimate the same regression equation as the baseline model. Wages are defined as the total wage bill divided by the number of permanent workers.

Columns (5) and (11) in Table 7 present the results for manufacturing and wholesale & retail trade, respectively. We highlight two results. First, in manufacturing, the coefficient of

Exports only is significantly positive. Noting that *Exports only* shows consistently negative and significant coefficients in Tables 5 and 6, the results imply that firms that engage in exports only absorb foreign shocks through wage adjustments rather than through employment adjustments. Second, for wholesale & retail trade firms, the signs and significance levels of coefficients are generally the same as those in the baseline model, except for the coefficient of *FDI firm*, which turns to be significant. Combined with the insignificant effect of *FDI firm* on the employment volatility of regular workers, the result suggests that FDI firms in wholesale & retail trade absorb foreign shocks through the wages of regular workers rather than through employment adjustments.

4 Concluding Remarks

In light of the increasing concerns over the relationship between globalization and labor market outcomes, this paper examines the effects of international trade and FDI on employment volatility, using large-scale, firm-level data from Japan. The major contributions of this paper are threefold. First, we distinguish between multinational firms, exporters, importers, and domestic firms. This enables us to examine the heterogeneous effects of foreign exposure on employment volatility. Second, we expand the industry coverage of the analysis, covering not only manufacturing but also wholesale & retail trade firms. Third, we take into account the difference between intrafirm trade and interfirm trade. This allows us to examine the mechanism by which foreign shocks can be transmitted to domestic employment.

Our major findings are summarized as follows. In manufacturing, the effect of exports on the volatility of employment varies, depending on the share of intrafirm exports to total sales. This result suggests that the effects of foreign demand shocks on domestic employment are transmitted through intrafirm exports. In wholesale & retail trade, the effect of exports is generally insignificant. Unlike manufacturing, there is no significant effect of foreign demand

shocks on domestic employment.

In both manufacturing and wholesale & retail trade, the employment volatility tends to become higher as the share of imports to total purchases increases. This result suggests that the effects of foreign supply shocks on domestic employment come from interfirm imports. Moreover, MNEs (FDI firms and foreign-owned firms) do not necessarily exhibit higher employment volatility. In manufacturing, therefore, FDI causes higher employment volatility only when the share of intrafirm exports to total sales becomes high. In wholesale & retail trade, FDI does not necessarily result in higher employment volatility.

For manufacturing, our results are similar to those of Kurz and Senses (2016), who found that, on average, firms that exported were less volatile than nontraders. However, as mentioned above, the story becomes slightly different if we take into account the effects of intrafirm trade and if we extend the analysis to wholesale & retail trade. These results together suggest that foreign supply and demand shocks could be transmitted not only through manufacturing firms but also through wholesale & retail trade firms. Further, a higher share of intrafirm trade could magnify the foreign demand shocks. In identifying the potential risks from foreign demand and supply shocks, it is important for policy makers to be aware of the heterogeneity between manufacturing and wholesale & retail trade, and the possible effects through intrafirm trade.

In conclusion, there are several research issues for the future that are worth mentioning. First, further investigation of FDI is an important extension. For example, employment volatility could vary between firms with production plants abroad and firms without such plants, if the substitution of domestic and foreign workers causes higher employment volatility for MNEs. Second, it is important to examine the effects on nonregular workers. In our data, some firms do not employ any nonregular workers. Because the employment growth rate of nonregular workers cannot be defined if firms do not employ any nonregular workers, the employment volatility of nonregular workers is beyond the scope of this paper. In

this connection, it is important to take into account the firm exit on employment volatility, because employment volatility cannot be defined for firms that exited from the domestic market. These issues will be investigated in our future research.

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Figure 1. Employment Share, by Trade and MNE Status: All Industries
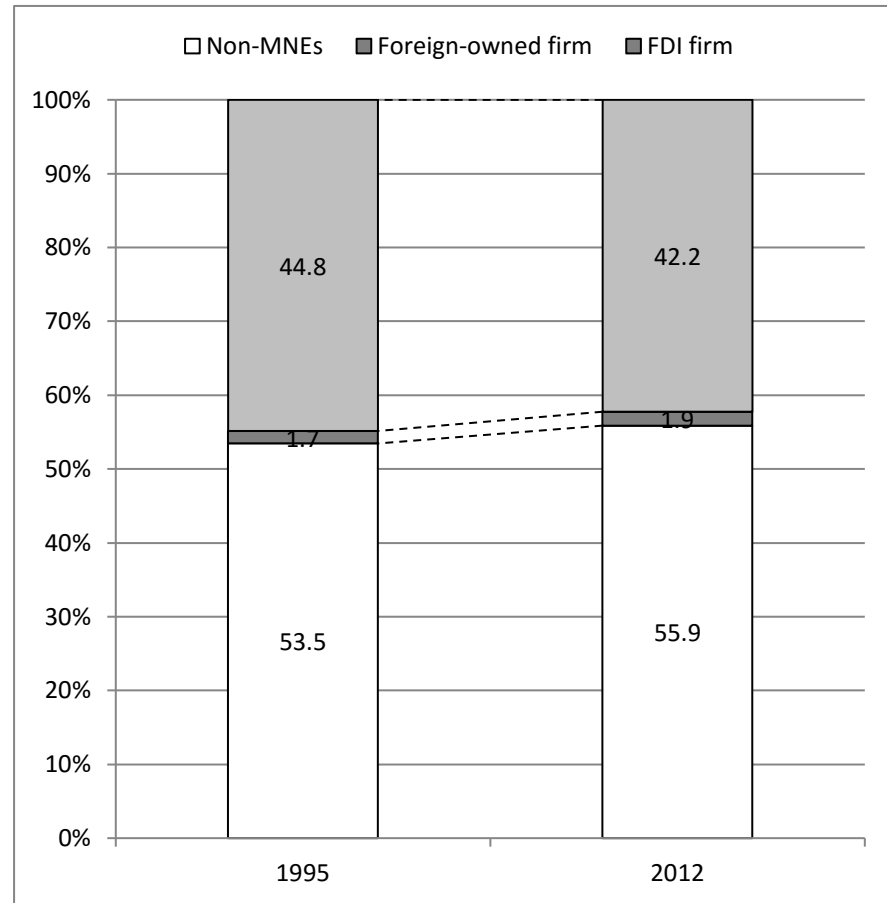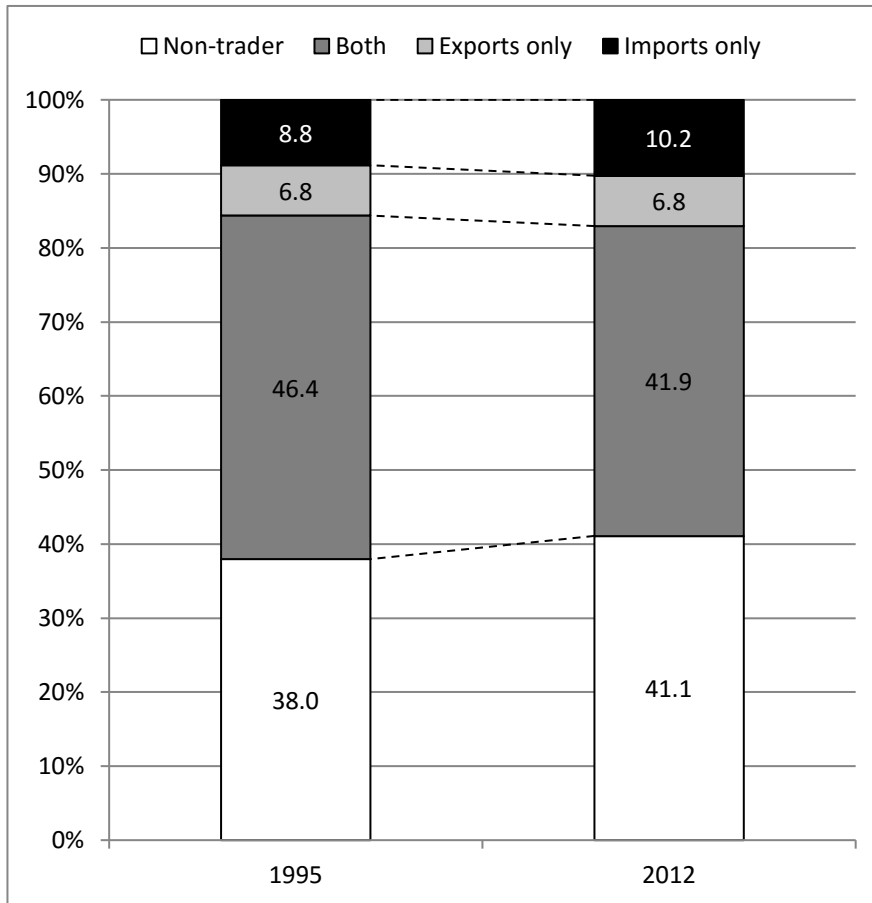
Source: Authors' calculation based on the BSJBSA.

Table 1. Basic Statistics, by Trade and MNE Status: All Industries

	# of firms	Share (%)	Average employment size	Employment volatility	
All industries				Mean	S.D.
Total	27,838	100.0	290	0.087	0.048
Non-trader	14,802	53.2	232	0.088	0.050
Both	8,118	29.2	407	0.085	0.044
Exports only	2,069	7.4	259	0.079	0.043
Imports only	2,849	10.2	283	0.094	0.050
Non-MNEs	20,824	74.8	224	0.087	0.049
Foreign-owned firm	464	1.7	355	0.096	0.052
FDI firm	6,550	23.5	497	0.086	0.045

Source: Authors' calculation based on the BSJBSA.

Table 2. Basic Statistics, by Trade and MNE Status and by Industry

	# of firms	Share (%)	Average employment size	Employment volatility	
Manufactruing				Mean	S.D.
Total	15,978	100.0	289	0.081	0.041
Non-trader	7,332	45.9	186	0.082	0.042
Both	5,552	34.7	450	0.081	0.040
Exports only	1,629	10.2	257	0.077	0.040
Imports only	1,465	9.2	231	0.085	0.042
Non-MNEs	11,115	69.6	190	0.081	0.041
Foreign-owned firm	212	1.3	415	0.082	0.038
FDI firm	4,651	29.1	519	0.082	0.041
Wholesale & retail trade					
Total	11,860	100.0	292	0.094	0.055
Non-trader	7,470	63.0	278	0.093	0.057
Both	2,566	21.6	312	0.093	0.051
Exports only	440	3.7	265	0.087	0.053
Imports only	1,384	11.7	337	0.103	0.054
Non-MNEs	9,709	81.9	262	0.094	0.056
Foreign-owned firm	252	2.1	304	0.108	0.059
FDI firm	1,899	16.0	444	0.096	0.053

Source: Authors' calculation based on the BSJBSA.

Table 3. Share of Non-production Workers, by Trade and MNE Status and by Industry

	All industries	Manufacturing	Wholesale & retail trade
Total	0.60	0.34	0.94
Non-trader	0.63	0.30	0.95
Both	0.56	0.40	0.91
Exports only	0.46	0.34	0.91
Imports only	0.63	0.35	0.93
Non-MNEs	0.61	0.32	0.95
Foreign-owned firm	0.74	0.47	0.96
FDI firm	0.54	0.39	0.91

Note: Intensities are average over the firms.
Source: Authors' calculation based on the BSJBSA.

Table 4. Export and Import Intensity, by Trade and MNE Status and by Industry

Unconditional intensity	All industries		Manufacturing		Wholesale & retail trade	
	# of firms	Intensity	# of firms	Intensity	# of firms	Intensity
Exports	27,838	0.03	15,978	0.04	11,860	0.01
Imports	27,838	0.04	15,978	0.04	11,860	0.05
Intra-firm exports	27,838	0.01	15,978	0.01	11,860	0.00
Intra-firm imports	27,838	0.02	15,978	0.02	11,860	0.02

Conditional intensity	All industries		Manufacturing		Wholesale & retail trade	
	# of firms	Intensity	# of firms	Intensity	# of firms	Intensity
Exports	10,187	0.08	7,181	0.08	3,006	0.05
Imports	10,967	0.11	7,017	0.10	3,950	0.14
Intra-firm exports	10,187	0.02	7,181	0.02	3,006	0.01
	(5,727)		(4,187)		(1,540)	
Intra-firm imports	10,967	0.04	7,017	0.04	3,950	0.05
	(5,583)		(3,836)		(1,747)	

Notes: Intensities are average over the firms. Conditional intensity shows the averages for firms with non-zero exports or imports. Figures in parentheses indicate the number of firms with non-zero intra-firm exports (or imports).

Source: Authors' calculation based on the BSJBSA.

Table 5. Regression Results: Manufacturing

	(1)	(2)	(3)	(4)	(5)
	Baseline	6-year window	Actual growth	Before 2009	Includes TFP shocks
Both	-0.013	-0.007	-0.002	-0.009	-0.022
	(0.014)	(0.014)	(0.001)	(0.015)	(0.014)
Exports only	-0.047***	-0.023	-0.003***	-0.042***	-0.049***
	(0.015)	(0.014)	(0.001)	(0.016)	(0.015)
Imports only	0.027*	0.041***	0.001	0.043**	0.019
	(0.015)	(0.016)	(0.001)	(0.017)	(0.016)
Export intensity	-0.045	-0.016	-0.003	-0.100	-0.132**
	(0.059)	(0.052)	(0.005)	(0.069)	(0.060)
Import intensity	0.145**	0.022	0.015***	0.235***	0.119**
	(0.057)	(0.050)	(0.005)	(0.064)	(0.060)
FDI firm	0.036***	0.045***	-0.000	-0.017	0.023*
	(0.013)	(0.011)	(0.001)	(0.019)	(0.013)
Foreign-owned firm	-0.043	-0.004	-0.000	-0.001	-0.040
	(0.036)	(0.039)	(0.001)	(0.021)	(0.037)
Intra-firm both	0.003	0.026	-0.001	-0.032	0.005
	(0.017)	(0.018)	(0.002)	(0.025)	(0.018)
Intra-firm exports only	0.011	0.005	0.045***	0.591***	0.018
	(0.018)	(0.019)	(0.013)	(0.148)	(0.019)
Intra-firm imports only	0.004	-0.023	-0.002	0.036	0.002
	(0.021)	(0.023)	(0.008)	(0.110)	(0.022)
Intra-firm export intensity	0.485***	0.297***	0.003***	0.051***	0.542***
	(0.133)	(0.108)	(0.001)	(0.014)	(0.142)
Intra-firm import intensity	0.068	0.213***	-0.006*	-0.076*	0.073
	(0.096)	(0.081)	(0.003)	(0.042)	(0.100)
Number of observations	15,978	31,174	15,978	14,493	14,213
R-squared	0.043	0.048	0.046	0.041	0.073
Firm characteristics	Yes	Yes	Yes	Yes	Yes
Industry characteristics	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors are in parentheses. ***, **, and * indicate statistically significant at 1%, 5%, and 10% levels, respectively. For the results of firm- and industry-level control variables, see Table A3.
Source: Authors' calculation based on the BSJBSA and the JIP database.

Table 6. Regression Results: Wholesale & Retail Trade

	(1)	(2)	(3)	(4)	(5)
	Baseline	6-year window	Actual growth	Before 2009	Includes TFP shocks
Both	0.040**	-0.012	0.003*	0.039**	0.030
	(0.019)	(0.020)	(0.002)	(0.020)	(0.020)
Exports only	0.005	-0.033	0.002	-0.029	-0.014
	(0.028)	(0.028)	(0.003)	(0.029)	(0.030)
Imports only	0.135***	0.139***	0.010***	0.126***	0.123***
	(0.017)	(0.018)	(0.002)	(0.017)	(0.018)
Export intensity	0.053	-0.103	0.008	0.052	0.040
	(0.116)	(0.104)	(0.011)	(0.110)	(0.119)
Import intensity	0.276***	0.232***	0.026***	0.290***	0.285***
	(0.052)	(0.053)	(0.005)	(0.053)	(0.058)
FDI firm	0.032	0.074***	0.001	0.009	0.011
	(0.020)	(0.017)	(0.003)	(0.028)	(0.021)
Foreign-owned firm	0.061	-0.076	-0.001	0.022	0.076
	(0.053)	(0.069)	(0.003)	(0.035)	(0.063)
Intra-firm both	0.030	0.054*	0.002	0.015	0.008
	(0.027)	(0.028)	(0.003)	(0.028)	(0.029)
Intra-firm exports only	0.023	0.046	0.028	0.383	0.021
	(0.033)	(0.035)	(0.029)	(0.285)	(0.034)
Intra-firm imports only	0.029	0.012	-0.036***	-0.314***	0.062**
	(0.028)	(0.033)	(0.011)	(0.102)	(0.029)
Intra-firm export intensity	0.287	0.182	0.003	0.030	0.343
	(0.281)	(0.280)	(0.002)	(0.021)	(0.318)
Intra-firm import intensity	-0.362***	-0.138	0.007	0.037	-0.433***
	(0.101)	(0.105)	(0.006)	(0.053)	(0.110)
Number of observations	11,860	21,286	11,860	11,576	10,250
R-squared	0.059	0.043	0.070	0.058	0.099
Firm characteristics	Yes	Yes	Yes	Yes	Yes
Industry characteristics	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors are in parentheses. ***, **, and * indicate statistically significant at 1%, 5%, and 10% levels, respectively. For the results of firm- and industry-level control variables, see Table A3.
Source: Authors' calculation based on the BSJBSA and the JIP database.

Table 7. Regression Results: Extensions

	Manufacturing					Wholesale & retail trade					
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
	Baseline	Alternative trade / MNE status	Including temporary worker	Excluding part-time workers	Volatility of wages	Baseline	Alternative trade / MNE status	Including temporary worker	Excluding part-time workers	No MFG workers	Volatility of wages
Both	-0.013	-0.123***	-0.014	-0.049***	0.055***	0.040**	-0.077***	0.020	0.043**	0.058**	0.021
	(0.014)	(0.016)	(0.017)	(0.015)	(0.016)	(0.019)	(0.023)	(0.023)	(0.021)	(0.026)	(0.019)
Exports only	-0.047***	-0.094***	-0.050***	-0.083***	0.031*	0.005	-0.097***	0.051	0.012	-0.007	0.024
	(0.015)	(0.016)	(0.018)	(0.016)	(0.017)	(0.028)	(0.035)	(0.033)	(0.031)	(0.037)	(0.028)
Imports only	0.027*	-0.057***	0.033*	0.042**	0.045**	0.135***	0.047**	0.109***	0.145***	0.158***	0.032*
	(0.015)	(0.020)	(0.019)	(0.018)	(0.019)	(0.017)	(0.020)	(0.021)	(0.018)	(0.021)	(0.017)
Export intensity	-0.045	0.112*	-0.091	-0.179***	0.235***	0.053	0.244**	0.013	-0.079	0.168	0.085
	(0.059)	(0.061)	(0.060)	(0.063)	(0.063)	(0.116)	(0.119)	(0.118)	(0.129)	(0.164)	(0.112)
Import intensity	0.145**	0.300***	-0.020	0.234***	0.152**	0.276***	0.359***	0.261***	0.233***	0.272***	0.213***
	(0.057)	(0.060)	(0.061)	(0.062)	(0.067)	(0.052)	(0.055)	(0.060)	(0.056)	(0.065)	(0.054)
FDI firm	0.036***	-0.016	0.040***	-0.002	0.015	0.032	0.004	0.039*	0.020	0.003	0.047**
	(0.013)	(0.014)	(0.015)	(0.019)	(0.014)	(0.020)	(0.059)	(0.024)	(0.029)	(0.035)	(0.019)
Foreign-owned firm	-0.043	-0.115***	-0.061	0.002	0.037	0.061	-0.012	0.063	0.030	0.003	0.090*
	(0.036)	(0.041)	(0.047)	(0.020)	(0.043)	(0.053)	(0.023)	(0.067)	(0.035)	(0.043)	(0.054)
Intra-firm both	0.003	0.098***	0.031	0.028	0.008	0.030	0.088***	0.035	0.038	0.026	-0.012
	(0.017)	(0.018)	(0.022)	(0.024)	(0.020)	(0.027)	(0.029)	(0.033)	(0.030)	(0.038)	(0.026)
Intra-firm exports only	0.011	0.044***	0.018	0.505***	-0.008	0.023	0.084***	0.062	0.320	-0.209	0.026
	(0.018)	(0.015)	(0.023)	(0.151)	(0.021)	(0.033)	(0.028)	(0.039)	(0.305)	(0.564)	(0.034)
Intra-firm imports only	0.004	0.059***	-0.004	-0.021	0.007	0.029	0.126***	-0.029	-0.297***	-0.546***	0.010
	(0.021)	(0.018)	(0.026)	(0.109)	(0.024)	(0.028)	(0.025)	(0.037)	(0.104)	(0.129)	(0.027)
Intra-firm export intensity	0.485***	0.371***	0.494***	0.015	0.074	0.287	0.268	0.018	0.027	0.051**	0.323
	(0.133)	(0.134)	(0.116)	(0.014)	(0.134)	(0.281)	(0.284)	(0.296)	(0.021)	(0.026)	(0.291)
Intra-firm import intensity	0.068	-0.055	0.235**	-0.072*	-0.134	-0.362***	-0.439***	-0.276**	0.045	0.170**	-0.464***
	(0.096)	(0.099)	(0.094)	(0.043)	(0.111)	(0.101)	(0.106)	(0.117)	(0.057)	(0.070)	(0.109)
Number of observations	15,978	15,978	13,137	15,974	14,936	11,860	11,860	9,169	11,820	8,179	10,963
R-squared	0.043	0.047	0.081	0.060	0.027	0.059	0.055	0.051	0.059	0.062	0.027
Firm characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: Robust standard errors are in parentheses. ***, **, and * indicate statistically significant at 1%, 5%, and 10% levels, respectively. For the results of firm- and industry-level control variables, see Table A5.

Source: Authors' calculation based on the BSJBSA and the JIP database.

Table A1. Number of Firms, by Industry and Year

	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Manufacturing	**11,301**	**11,602**	**11,921**	**12,336**	**12,203**	**11,803**	**11,939**	**11,729**	**11,346**	**11,794**	**11,634**	**11,516**	**11,698**	**11,788**	**11,549**	**10,967**	**10,865**	**10,575**
Food products and beverages	1,326	1,343	1,392	1,440	1,464	1,408	1,440	1,433	1,388	1,451	1,424	1,429	1,454	1,469	1,472	1,382	1,387	1,356
Textiles	281	301	316	327	322	300	293	285	262	268	262	244	243	242	229	211	207	207
Pulp ,paper and paper products	371	382	383	403	387	382	376	371	370	373	355	354	356	355	351	345	339	326
Chemicals	834	826	840	846	850	833	832	821	804	838	818	797	806	814	798	778	763	767
Petroleum and coal products	661	675	700	717	710	683	686	673	658	698	688	693	700	708	694	664	653	634
Non-metallic mineral products	512	522	537	552	530	507	488	463	439	448	441	429	428	413	416	383	376	371
Basic metal	639	647	656	685	668	666	660	655	635	663	676	669	687	696	698	666	665	641
Fabricated metal products	824	839	873	908	894	862	897	869	843	870	863	859	870	900	872	832	813	790
Machinery	1,360	1,415	1,434	1,487	1,466	1,413	1,450	1,441	1,400	1,469	1,474	1,459	1,497	1,512	1,491	1,436	1,410	1,389
Electrical machinery	1,598	1,656	1,695	1,764	1,747	1,723	1,725	1,704	1,654	1,712	1,679	1,671	1,686	1,656	1,614	1,518	1,496	1,426
Transport equipment	995	1,026	1,053	1,078	1,080	1,040	1,058	1,038	1,021	1,074	1,040	1,045	1,076	1,097	1,065	1,025	1,027	1,010
Precision instruments	132	140	143	152	149	150	151	152	156	159	154	154	158	159	158	141	148	143
Other manufacturing	1,768	1,830	1,899	1,977	1,936	1,836	1,883	1,824	1,716	1,771	1,760	1,713	1,737	1,767	1,691	1,586	1,581	1,515
Wholesale & retail trade	**8,094**	**8,428**	**8,593**	**8,922**	**8,727**	**8,327**	**8,459**	**8,197**	**7,977**	**8,139**	**8,036**	**7,831**	**7,995**	**8,024**	**7,814**	**7,460**	**7,432**	**7,202**
Total	**19,395**	**20,030**	**20,514**	**21,258**	**20,930**	**20,130**	**20,398**	**19,926**	**19,323**	**19,933**	**19,670**	**19,347**	**19,693**	**19,812**	**19,363**	**18,427**	**18,297**	**17,777**

Note: Industry classification is based on sector (2-digit) level.
Source: Authors' calculation based on the BSJBSA.

Table A2. Summary Statistics

	All industries					Manufacturing					Wholesale & retail trade				
	# of firms	Mean	S.D.	p25	p75	# of firms	Mean	S.D.	p25	p75	N	Mean	S.D.	p25	p75
Employment volatility	27,838	-2.586	0.542	-2.954	-2.205	15,978	-2.632	0.505	-2.968	-2.276	11,860	-2.526	0.584	-2.933	-2.098
Both	27,838	0.292	0.455	0.000	1.000	15,978	0.347	0.476	0.000	1.000	11,860	0.216	0.412	0.000	0.000
Exports only	27,838	0.074	0.262	0.000	0.000	15,978	0.102	0.303	0.000	0.000	11,860	0.037	0.189	0.000	0.000
Imports only	27,838	0.102	0.303	0.000	0.000	15,978	0.092	0.289	0.000	0.000	11,860	0.117	0.321	0.000	0.000
Export intensity	27,838	0.028	0.087	0.000	0.005	15,978	0.038	0.100	0.000	0.018	11,860	0.014	0.062	0.000	0.000
Import intensity	27,838	0.045	0.128	0.000	0.015	15,978	0.042	0.108	0.000	0.025	11,860	0.048	0.151	0.000	0.004
Intra-firm both	27,838	0.155	0.362	0.000	0.000	15,978	0.195	0.396	0.000	0.000	11,860	0.102	0.302	0.000	0.000
Intra-firm exports only	27,838	0.051	0.219	0.000	0.000	15,978	0.067	0.251	0.000	0.000	11,860	0.028	0.166	0.000	0.000
Intra-firm imports only	27,838	0.046	0.208	0.000	0.000	15,978	0.045	0.208	0.000	0.000	11,860	0.046	0.209	0.000	0.000
Intra-firm Export intensity	27,838	0.008	0.037	0.000	0.000	15,978	0.011	0.045	0.000	0.000	11,860	0.003	0.024	0.000	0.000
Intra-firm Import intensity	27,838	0.016	0.075	0.000	0.000	15,978	0.016	0.063	0.000	0.000	11,860	0.015	0.090	0.000	0.000
FDI firm	27,838	0.235	0.424	0.000	0.000	15,978	0.291	0.454	0.000	1.000	11,860	0.160	0.367	0.000	0.000
Foreign-owned firm	27,838	0.017	0.128	0.000	0.000	15,978	0.013	0.114	0.000	0.000	11,860	0.021	0.144	0.000	0.000
Employment	27,838	5.141	0.884	4.451	5.620	15,978	5.136	0.876	4.457	5.596	11,860	5.149	0.896	4.443	5.650
Employment^2	27,838	27.220	10.010	19.810	31.580	15,978	27.140	9.932	19.860	31.310	11,860	27.320	10.110	19.740	31.920
Number of establishments	27,838	1.540	1.100	0.693	2.251	15,978	1.128	0.938	0.363	1.719	11,860	2.096	1.058	1.425	2.726
Age	27,838	40.750	17.800	28.910	53.000	15,978	41.870	17.670	30.500	53.500	11,860	39.240	17.870	26.290	52.000
Shre of non-production workers	27,838	0.597	0.352	0.264	1.000	15,978	0.342	0.217	0.178	0.462	11,860	0.940	0.148	0.984	1.000
R&D-sales ratio	27,838	0.006	0.021	0.000	0.003	15,978	0.010	0.024	0.000	0.009	11,860	0.001	0.015	0.000	0.000
Import penetration	27,838	0.069	0.093	0.011	0.091	15,978	0.113	0.101	0.050	0.136					
Industry non-producton worker share	27,838	1.773	0.681	1.378	2.053	15,978	2.133	0.684	1.591	2.587	11,860	1.288	0.222	1.017	1.458
Industry employement size	27,838	0.746	0.222	0.567	0.949	15,978	0.589	0.165	0.511	0.666	11,860	0.959	0.028	0.943	0.987
Industry capital-labor ratio	27,838	12.570	1.377	11.530	13.980	15,978	11.510	0.806	10.960	11.920	11,860	14.000	0.056	13.980	14.020

Notes: For the definition of variables, see the main text.

Source: Authors' calculation based on the BSJBSA and the JIP database.

Table A3. Regression Results: All Coefficients

	Manufacturing					Wholesale & retail trade				
	(1)	(2)	(3)	(4)	(5)	(1)	(2)	(3)	(4)	(5)
	Baseline	6-year window	Actual growth	Before 2009	Includes TFP shocks	Baseline	6-year window	Actual growth	Before 2009	Includes TFP shocks
Both	-0.013	-0.007	-0.002	-0.009	-0.022	0.040**	-0.012	0.003*	0.039**	0.030
	(0.014)	(0.014)	(0.001)	(0.015)	(0.014)	(0.019)	(0.020)	(0.002)	(0.020)	(0.020)
Exports only	-0.047***	-0.023	-0.003***	-0.042***	-0.049***	0.005	-0.033	0.002	-0.029	-0.014
	(0.015)	(0.014)	(0.001)	(0.016)	(0.015)	(0.028)	(0.028)	(0.003)	(0.029)	(0.030)
Imports only	0.027*	0.041***	0.001	0.043**	0.019	0.135***	0.139***	0.010***	0.126***	0.123***
	(0.015)	(0.016)	(0.001)	(0.017)	(0.016)	(0.017)	(0.018)	(0.002)	(0.017)	(0.018)
Export intensity	-0.045	-0.016	-0.003	-0.100	-0.132**	0.053	-0.103	0.008	0.052	0.040
	(0.059)	(0.052)	(0.005)	(0.069)	(0.060)	(0.116)	(0.104)	(0.011)	(0.110)	(0.119)
Import intensity	0.145**	0.022	0.015***	0.235***	0.119**	0.276***	0.232***	0.026***	0.290***	0.285***
	(0.057)	(0.050)	(0.005)	(0.064)	(0.060)	(0.052)	(0.053)	(0.005)	(0.053)	(0.058)
FDI firm	0.036***	0.045***	-0.000	-0.017	0.023*	0.032	0.074***	0.001	0.009	0.011
	(0.013)	(0.011)	(0.001)	(0.019)	(0.013)	(0.020)	(0.017)	(0.003)	(0.028)	(0.021)
Foreign-owned firm	-0.043	-0.004	-0.000	-0.001	-0.040	0.061	-0.076	-0.001	0.022	0.076
	(0.036)	(0.039)	(0.001)	(0.021)	(0.037)	(0.053)	(0.069)	(0.003)	(0.035)	(0.063)
Intra-firm both	0.003	0.026	-0.001	-0.032	0.005	0.030	0.054*	0.002	0.015	0.008
	(0.017)	(0.018)	(0.002)	(0.025)	(0.018)	(0.027)	(0.028)	(0.003)	(0.028)	(0.029)
Intra-firm exports only	0.011	0.005	0.045***	0.591***	0.018	0.023	0.046	0.028	0.383	0.021
	(0.018)	(0.019)	(0.013)	(0.148)	(0.019)	(0.033)	(0.035)	(0.029)	(0.285)	(0.034)
Intra-firm imports only	0.004	-0.023	-0.002	0.036	0.002	0.029	0.012	-0.036***	-0.314***	0.062**
	(0.021)	(0.023)	(0.008)	(0.110)	(0.022)	(0.028)	(0.033)	(0.011)	(0.102)	(0.029)
Intra-firm export intensity	0.485***	0.297***	0.003***	0.051***	0.542***	0.287	0.182	0.003	0.030	0.343
	(0.133)	(0.108)	(0.001)	(0.014)	(0.142)	(0.281)	(0.280)	(0.002)	(0.021)	(0.318)
Intra-firm import intensity	0.068	0.213***	-0.006*	-0.076*	0.073	-0.362***	-0.138	0.007	0.037	-0.433***
	(0.096)	(0.081)	(0.003)	(0.042)	(0.100)	(0.101)	(0.105)	(0.006)	(0.053)	(0.110)
Firm characteristics										
Empoyment	0.213***	-0.061	0.020***	0.163***	0.173***	0.327***	0.072	0.037***	0.326***	0.236***
	(0.046)	(0.043)	(0.004)	(0.050)	(0.047)	(0.060)	(0.057)	(0.006)	(0.061)	(0.063)
Empoyment^2	-0.021***	-0.001	-0.002***	-0.017***	-0.016***	-0.025***	-0.006	-0.003***	-0.025***	-0.016***
	(0.004)	(0.004)	(0.000)	(0.004)	(0.004)	(0.005)	(0.005)	(0.000)	(0.005)	(0.006)
Number of establishments	0.004	0.002	0.000	0.008	0.011*	-0.000	-0.011	-0.000	-0.001	0.001
	(0.006)	(0.006)	(0.001)	(0.007)	(0.006)	(0.007)	(0.007)	(0.001)	(0.007)	(0.007)
Age	-0.004***	-0.003***	-0.000***	-0.003***	-0.003***	-0.004***	-0.005***	-0.000***	-0.004***	-0.004***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Share of non-production workers	-0.115***	-0.077***	-0.010***	-0.097***	-0.138***	-0.089***	-0.126***	-0.004	-0.078**	-0.045
	(0.023)	(0.021)	(0.002)	(0.025)	(0.023)	(0.034)	(0.031)	(0.003)	(0.034)	(0.036)
R&D-sales ratio	-0.635	-1.125***	-0.035	-1.198***	-1.664***	-0.174	-0.113	-0.012	-0.156	-2.966**
	(0.423)	(0.243)	(0.036)	(0.291)	(0.255)	(0.271)	(0.358)	(0.030)	(0.262)	(1.349)
Volatility of productivity					0.502***					1.002***
					(0.025)					(0.050)
Industry characteristics										
Import penetration	0.305***	0.172***	0.024***	0.353***	0.317***					
	(0.042)	(0.051)	(0.003)	(0.048)	(0.043)					
Industry skill share	-0.142***	-0.251***	-0.012***	-0.201***	-0.100***	-0.795***	-2.689***	-0.111***	-0.167	-1.547***
	(0.029)	(0.071)	(0.002)	(0.044)	(0.029)	(0.273)	(0.973)	(0.025)	(0.327)	(0.295)
Industry size	0.038***	0.012*	0.003***	0.032***	0.042***	-0.076	-0.655***	-0.012	0.098	0.103
	(0.005)	(0.007)	(0.000)	(0.006)	(0.005)	(0.122)	(0.206)	(0.012)	(0.137)	(0.125)
Industry capital-labor ratio	-0.033***	-0.039***	-0.003***	-0.034***	-0.042***	-0.431***	-0.738***	-0.046***	-0.358***	-0.566***
	(0.006)	(0.010)	(0.000)	(0.006)	(0.006)	(0.034)	(0.122)	(0.003)	(0.041)	(0.038)
Constant	-3.312***	-2.223***	0.019*	-3.111***	-3.422***	-0.953	10.117***	0.333**	-4.081**	-2.629
	(0.139)	(0.169)	(0.011)	(0.153)	(0.144)	(1.694)	(3.914)	(0.168)	(1.922)	(1.735)
Number of observations	15,978	31,174	15,978	14,493	14,213	11,860	21,286	11,860	11,576	10,250
R-squared	0.043	0.048	0.046	0.041	0.073	0.059	0.043	0.070	0.058	0.099

For notes and sources, see Table 5.

Table A4. Extensions: All Coefficients

	(1) Baseline	(2) Alternative trade / MNE status	(3) Including temporary worker	(4) Excluding part-time workers	(5) Volatility of wages
Both	-0.013	-0.123***	-0.014	-0.049***	0.055***
	(0.014)	(0.016)	(0.017)	(0.015)	(0.016)
Exports only	-0.047***	-0.094***	-0.050***	-0.083***	0.031*
	(0.015)	(0.016)	(0.018)	(0.016)	(0.017)
Imports only	0.027*	-0.057***	0.033*	0.042**	0.045**
	(0.015)	(0.020)	(0.019)	(0.018)	(0.019)
Export intensity	-0.045	0.112*	-0.091	-0.179***	0.235***
	(0.059)	(0.061)	(0.060)	(0.063)	(0.063)
Import intensity	0.145**	0.300***	-0.020	0.234***	0.152**
	(0.057)	(0.060)	(0.061)	(0.062)	(0.067)
FDI firm	0.036***	-0.016	0.040***	-0.002	0.015
	(0.013)	(0.014)	(0.015)	(0.019)	(0.014)
Foreign-owned firm	-0.043	-0.115***	-0.061	0.002	0.037
	(0.036)	(0.041)	(0.047)	(0.020)	(0.043)
Intra-firm both	0.003	0.098***	0.031	0.028	0.008
	(0.017)	(0.018)	(0.022)	(0.024)	(0.020)
Intra-firm exports only	0.011	0.044***	0.018	0.505***	-0.008
	(0.018)	(0.015)	(0.023)	(0.151)	(0.021)
Intra-firm imports only	0.004	0.059***	-0.004	-0.021	0.007
	(0.021)	(0.018)	(0.026)	(0.109)	(0.024)
Intra-firm export intensity	0.485***	0.371***	0.494***	0.015	0.074
	(0.133)	(0.134)	(0.116)	(0.014)	(0.134)
Intra-firm import intensity	0.068	-0.055	0.235**	-0.072*	-0.134
	(0.096)	(0.099)	(0.094)	(0.043)	(0.111)
Firm characteristics					
Empoyment	0.213***	0.219***	0.467***	0.285***	0.168***
	(0.046)	(0.046)	(0.052)	(0.049)	(0.050)
Empoyment^2	-0.021***	-0.021***	-0.034***	-0.028***	-0.020***
	(0.004)	(0.004)	(0.005)	(0.004)	(0.004)
Number of establishments	0.004	0.011*	-0.086***	0.020***	0.044***
	(0.006)	(0.006)	(0.007)	(0.007)	(0.007)
Age	-0.004***	-0.003***	-0.005***	-0.003***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Share of non-production workers	-0.115***	-0.108***	0.101***	-0.180***	0.105***
	(0.023)	(0.023)	(0.026)	(0.024)	(0.025)
R&D-sales ratio	-0.635	-0.511	-0.898**	-0.773**	0.656***
	(0.423)	(0.388)	(0.397)	(0.344)	(0.190)
Industry characteristics					
Import penetration	0.305***	0.321***	0.236***	0.534***	0.026
	(0.042)	(0.042)	(0.044)	(0.045)	(0.047)
Industry skill share	-0.142***	-0.138***	-0.288***	-0.019	0.141***
	(0.029)	(0.029)	(0.046)	(0.031)	(0.032)
Industry size	0.038***	0.040***	0.070***	0.069***	0.008
	(0.005)	(0.005)	(0.006)	(0.006)	(0.006)
Industry capital-labor ratio	-0.033***	-0.032***	0.000	-0.069***	-0.035***
	(0.006)	(0.006)	(0.007)	(0.006)	(0.007)
Constant	-3.312***	-3.365***	-4.366***	-3.720***	-2.507***
	(0.139)	(0.138)	(0.160)	(0.151)	(0.156)
Number of observations	15,978	15,978	13,137	15,974	14,936
R-squared	0.043	0.047	0.081	0.060	0.027

For notes and sources, see Table 7.

Table A5. Extensions: Wholesale & Retail Trade, All Coefficients

	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline	Alternative trade / MNE status	Including temporary worker	Excluding part-time workers	No MFG workers	Volatility of wages
Both	0.040**	-0.077***	0.020	0.043**	0.058**	0.021
	(0.019)	(0.023)	(0.023)	(0.021)	(0.026)	(0.019)
Exports only	0.005	-0.097***	0.051	0.012	-0.007	0.024
	(0.028)	(0.035)	(0.033)	(0.031)	(0.037)	(0.028)
Imports only	0.135***	0.047**	0.109***	0.145***	0.158***	0.032*
	(0.017)	(0.020)	(0.021)	(0.018)	(0.021)	(0.017)
Export intensity	0.053	0.244**	0.013	-0.079	0.168	0.085
	(0.116)	(0.119)	(0.118)	(0.129)	(0.164)	(0.112)
Import intensity	0.276***	0.359***	0.261***	0.233***	0.272***	0.213***
	(0.052)	(0.055)	(0.060)	(0.056)	(0.065)	(0.054)
FDI firm	0.032	0.004	0.039*	0.020	0.003	0.047**
	(0.020)	(0.059)	(0.024)	(0.029)	(0.035)	(0.019)
Foreign-owned firm	0.061	-0.012	0.063	0.030	0.003	0.090*
	(0.053)	(0.023)	(0.067)	(0.035)	(0.043)	(0.054)
Intra-firm both	0.030	0.088***	0.035	0.038	0.026	-0.012
	(0.027)	(0.029)	(0.033)	(0.030)	(0.038)	(0.026)
Intra-firm exports only	0.023	0.084***	0.062	0.320	-0.209	0.026
	(0.033)	(0.028)	(0.039)	(0.305)	(0.564)	(0.034)
Intra-firm imports only	0.029	0.126***	-0.029	-0.297***	-0.546***	0.010
	(0.028)	(0.025)	(0.037)	(0.104)	(0.129)	(0.027)
Intra-firm export intensity	0.287	0.268	0.018	0.027	0.051**	0.323
	(0.281)	(0.284)	(0.296)	(0.021)	(0.026)	(0.291)
Intra-firm import intensity	-0.362***	-0.439***	-0.276**	0.045	0.170**	-0.464***
	(0.101)	(0.106)	(0.117)	(0.057)	(0.070)	(0.109)
Firm characteristics						
Empoyment	0.327***	0.319***	0.145**	0.364***	0.256***	0.306***
	(0.060)	(0.060)	(0.065)	(0.056)	(0.073)	(0.056)
Empoyment^2	-0.025***	-0.024***	-0.007	-0.027***	-0.019***	-0.028***
	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)	(0.005)
Number of establishments	-0.000	0.002	-0.017**	-0.018**	0.005	0.032***
	(0.007)	(0.007)	(0.008)	(0.008)	(0.008)	(0.007)
Age	-0.004***	-0.004***	-0.005***	-0.004***	-0.004***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Share of non-production workers	-0.089***	-0.101***	-0.129***	-0.216***		-0.309***
	(0.034)	(0.034)	(0.041)	(0.038)		(0.036)
R&D-sales ratio	-0.174	-0.091	-0.045	-0.288	0.683***	0.997***
	(0.271)	(0.297)	(0.625)	(0.240)	(0.255)	(0.189)
Industry characteristics						
Import penetration						
Industry skill share	-0.795***	-0.804***	-1.535**	0.065	-0.636*	1.082***
	(0.273)	(0.273)	(0.622)	(0.312)	(0.334)	(0.291)
Industry size	-0.076	-0.088	-0.049	0.289***	-0.054	-0.174**
	(0.122)	(0.122)	(0.266)	(0.089)	(0.134)	(0.087)
Industry capital-labor ratio	-0.431***	-0.396***	-0.395***	-0.255***	-0.432***	-0.039
	(0.034)	(0.034)	(0.096)	(0.051)	(0.040)	(0.049)
Constant	-0.953	-0.777	-0.108	-6.985***	-1.317	-1.247
	(1.694)	(1.700)	(3.567)	(1.244)	(1.862)	(1.180)
Number of observations	11,860	11,860	9,169	11,820	8,179	10,963
R-squared	0.059	0.057	0.051	0.059	0.062	0.027

For notes and sources, see Table 7.